entitled "A Bayesian-Update Based Location Prediction Method For CDMA Systems", filed in the names of K.K. Chang et al on April 20, 1999; and U.S. Serial No. 09/321,729, now U.S. Patent No. 6,263,208, issued on July 17, 2001, entitled "Geolocation Estimation Method For CDMA Terminals Based On Pilot Strength Measurements", filed in the names of K.K. CHANG et al on May 28, 1999. These related applications are assigned to the assignee of the present invention and are meant to be incorporated herein by reference.--

a1

On page 2, please replace the first full paragraph with the following paragraph:

--In the above-noted related patent application U.S. Patent No. 6,496,701 entitled "Pattern Recognition-Based Geolocation", RF characteristics pertaining to one or more pilot signals radiated from a base station and specific to a particular location within the service area are detected by a mobile unit and transmitted back to a base station where they are matched to a known set of RF characteristics and other information obtained from making attribute information measurements at all the grid points (sub-cells) in a cellular service area and which are then stored in a database located, for example, in a base station server.--

a2

On page 2, please replace the second full paragraph with the following paragraph:

--In the above-noted related patent application U.S. Serial No. 09/294,997 entitled "A Bayesian-Update Based Location Prediction Method For CDMA systems", the invention is directed to a method of estimating, by a Bayesian probability algorithm, the location of a mobile unit in the service area of a CDMA cellular telephone system using a model based approach which, among other things, simplifies the generation of a database containing a pilot signal visibility probabilities. This eliminates the need for repeated attribute measurements at all of the grid points in the service area.

a3

On page 2, please replace the third full paragraph with the following paragraph:

--In the above-noted related patent U.S. Patent No. 6,263,608 entitled "Geolocation Estimation Method For CDMA Terminals Based On Pilot Strength Measurements", the invention is directed to a method of estimating the location of a mobile unit in the service area of a CDMA cellular telephone system also using a model based approach, but which now eliminates the need for a stored database containing pilot signal visibility probabilities for all of the grid points or sub-cells in the cellular service area. The estimation procedure is based entirely on analytical results involving one or more key approximations derived,

a4

A4 cont

for example, from an integrated model of the wireless communications system, its RF environment, and attribute measurement.--

On page 4, please replace the third full paragraph, containing lines 15-23, with the following paragraph:

--In the invention described in the referenced related patent, U.S. Patent No. 6,496,701 entitled "Pattern Recognition-Based Geolocation," each sub-cell $18_1,\ldots,18_n$ of the service area 10 is identified by a set of observable

A5

characteristics which are referred to as attributes. Examples of attributes are pilot signal strengths (Ec/Io), phase-offsets, angles of arrival, and pilot round trip delays. The invention of Patent No. 6,496,701 includes a database which contains attribute information which differentiates one sub-cell 18 from another and is generated by making a repeated and exhaustive survey which involves taking repeated measurements at all the sub-cells $18_1,\ldots,18_n$ (Figure 2) of the service area 10.--

On page 5, please replace the second paragraph, containing lines 7-22, with the following paragraph:

A6

--In the above-referenced related application, Serial No. 09/294,997, entitled "A Bayesian-Update Based Location Prediction Method For CDMA systems", a database is also used to assist the process of location estimation.

However, in contrast to the first referenced patent application, i.e. U.S. Patent No. 6,496,701, it uses a model based approach to generate a database containing pilot visibility probabilities for different sub-cells 18 in the service area 10. The model-based approach requires that a limited number of pilot strength measurements be carried out along a few representative routes in the service area 10. These measurements are then used to identify the parameters of the model that characterizes the service area and its RF environment. Once these parameters are identified, simulations are then carried out to populate the database containing the pilot visibility probabilities, which are used in the computation of the location distribution of a mobile unit requesting location service. An iterative procedure based on a Bayesian probability computation is then used to obtain improved estimates of the mobile unit's location in response to multiple sets of attribute measurements being reported by the mobile unit 20. The model-based approach eliminates the need to carry out extensive measurements required by the first named invention, U.S. Patent No. 6,496,701.--

a6 cont

On page 5, please replace the third paragraph, containing lines 23-29, through page 6, lines 1-2, with t he following paragraph:

--In the above-referenced related patent U.S. Patent No. 6,263,208, entitled "Geolocation Estimation Method For CDMA Terminals Based On Pilot

a7

Strength Measurements", the model-based approach embodied in Serial No. 09/294,997, "A Bayesian-Update Based Location Prediction Method...." to characterize the RF environment is used, as is the iterative procedure for computing the Bayesian posterior distribution for the location of the mobile. A7 cont However, the database containing pilot visibility probabilities is replaced by analytical formulas that can be evaluated in real time. The evaluation procedures are compact and can typically be evaluated in the digital computer apparatus 23 shown in Figure 3.--

On page 6, please replace the second paragraph, containing lines 3-18, with the following paragraph:

--Considering the present invention, the analytic formulation for the pilot visibility probabilities taught in the above-referenced patent, U.S. Patent No. A8 6,263,208, "Geolocation Estimation Method For CDMA terminals Based On Pilot Strength Measurements", now serve as the starting point for the derivation of two likelihood functions, hereafter referred to as the frequentist and Bayes-modified likelihood functions, respectively. Each of the likelihood functions is derived based on the assumptions and mathematical formulations described in attached Appendix A. In as much as the likelihood functions depend on the analytic evaluation of the pilot visibility probabilities, attached

Appendix B provides a self-contained development of the relevant details of these formulas. Each likelihood function is a function of (x, y), an arbitrary location of the mobile unit 20 in the x and y grid shown in Figure 2. Accordingly, each likelihood function is used in a first method to obtain a maximum likelihood (ML) estimator of the location of the mobile unit 20 by finding the (x, y) coordinates which maximizes the value of the respective likelihood function. An iterative technique for sequentially updating each ML estimator with additional pilot signal strength measurements is utilized. In a second method, each of the two likelihood functions are also incorporated into a sequential Bayesian procedure, which outputs a posterior distribution for the location of the mobile unit.--

a8 Cont

On page 17, please replace the first paragraph with the following paragraph:

--In this Appendix, we drive the approximations $\tilde{\theta}_{ij}(x, y)$ of the pilot visibility probabilities. The notation used in this Appendix is the same as what has been introduced earlier in this specification. Consider a grid point $(x, y) \in A$. As in the above-referenced related patent U.S. Patent No. 6,263,208, entitled, "Geolocation Estimation Method For CDMA Terminals Based On Pilot

a9

Strength Measurements", the RF power received by the mobile unit 20 from sector j of base station i is modeled by the expression

$$R_{ij}(x,y) = T_{ij}G_{ij}(x,y)L_{ij}(x,y)F_{ij}(x,y)M_{ij}(x,y) \qquad \text{(B1)}$$

where T_{ij} is the transmit power associated with the sector, $G_{ij}(x,y)$ is the antenna gain for the sector along the direction pointing towards the location $(x,y) \in A$, $L_{ij}(x,y)$ is the distance loss between the base station associated with the sector and the location $(x,y) \in A$, $F_{ij}(x,y)$ is the shadow fading factor and $M_{ij}(x,y)$ is the measurement noise factor, all in absolute, not dB, units. The measurement noise factor is meant to include the effects of fast fading (e.g., Rayleigh/Rician) as well as inaccuracies in the measurement process. If γ denotes the fraction of T_{ij} that is used for the pilot channel, then $\gamma R_{ij}(x,y)$ is the pilot channel power received by the mobile unit 20 when it is located at $(x,y) \in A$.--

A9 Cont

IN THE CLAIMS

Please amend claims 6-8 as follows:

6. (Amended) A method according to claim 1 wherein said procedure comprises sequential Bayesian procedure characteristics.

A10 Sub C1